
**Review of On-Farm Disposal
Treatment Risks
and the
Potential for Recycling of Wastes
produced from
Commercial Chicken Farms
and Processors**

CONSULTATION DRAFT



Environment Protection Agency
Government of South Australia



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and the Potential for Recycling of Wastes Produced
From Commercial Chicken Farms and Processors**

Prepared for the Environment Protection Agency
by

PPK Environment & Infrastructure Pty Ltd

November 1999

The views expressed in this report do not necessarily reflect the views of the Environment Protection Authority, and the report is provided for public consultation purposes only. The Authority cannot guarantee the accuracy of the content of this report, and does not accept liability for any loss or damage incurred as a result of relying on the accuracy of the content of this report.

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Executive Summary

PPK Environment & Infrastructure Pty Ltd was commissioned by the South Australian Environment Protection Agency to undertake a review of the potential environmental and health impacts of on-farm disposal of chicken carcasses, and to recommend best practice methods for the environmentally sustainable management of chicken meat industry waste.

The farming of chickens for the purpose of meat production leads to the generation of significant volumes (estimated to be 89,000 tonnes per annum) of solid wastes, which include chicken manure, feed residues, litter, dead chicken carcasses and meat processing residues. Poor management of these wastes can create major environmental and public health issues.

Key environmental and public health issues for chicken farmers and processors include:

- *odour from the storage and decomposition of the waste*
- *groundwater and surface water contamination from waste leachates generated during storage or on-farm disposal*
- *vermin and fly infestation due to inadequate storage*
- *dust, odour and the potential leakage of waste material during the transport of the waste*
- *surface water pollution and nutrient overload in soils from the inappropriate application of litter/manure material*
- *pathogen contamination on food produce from the inappropriate application of litter/manure material.*

Further, poor handling and management of chicken industry waste is deemed preventable, and is poor environmental practice.

Initiatives in Australia and the United States have highlighted that chicken meat industry wastes can become a resource with the use of secondary and tertiary treatment systems. Valuable by-products from the treated chicken waste include fertiliser, soil amendment materials, processed material for animal consumption and animal fat by-products.

Worlds Best Practice in the management of chicken industry waste is led by the United States of America (USA). Environmental strategies adopted by the poultry industry in the USA aim to eliminate the on-farm disposal of dead birds from normal mortality by January 1, 2002 (US, Poultry Industry 1998).

Following trends established in the USA, technologies for composting waste from chicken breeder and grower farms have been established in South Australia, yet on-farm disposal of chicken carcass waste is still common practice. It is well recognised by the majority of the chicken meat processing and farming industry that on-farm disposal of this waste should be discouraged where feasible, and associated wastes should be recovered for recycling into high quality compost material.

Arrangements for rendering wastes from chicken meat processing plants are also well established for the major meat processors in South Australia.

Through extensive consultation with the industry in South Australia, it has been established that the recovery and recycling of chicken industry wastes are well supported, and that on-farm disposal should be discouraged. This is supported by the following facts:

- *There are currently well-established markets in South Australia for compost and protein products generated from chicken waste material.*
- *The potential for surface water contamination in catchment areas, such as the Mt Lofty Ranges Catchment, makes on-farm disposal an environmentally unacceptable option.*

- *It is generally recognised that management practices for chicken meat industry wastes must improve to encourage recycling and thereby minimise negative environmental and health impacts.*
- *Recycling practices will help avoid negative perceptions of the chicken farming and processing industry in the community.*

Therefore, within economic reasonableness and practicality, the on-farm disposal of chicken industry wastes should be avoided with the recognition that this waste can be recycled into a valuable resource.

In order for recycling systems associated with chicken industry wastes to work effectively in South Australia, a formal cooperative agreement between chicken processors, farmers and recycling processors needs to be in place. Through the development of best practice waste management policies for the industry, participation in recycling schemes could be improved upon. Best practice policies would assist individual farmers and processors, relevant industry associations, and local and state government bodies to address specific local environmental and health concerns with chicken industry waste disposal and recycling practices.

A cooperative approach between the chicken meat industry and the government is required to encourage the recycling of chicken meat industry wastes and eliminate on-farm disposal where practicable. Industry and government policy needs to ensure that environmental and health issues are adequately addressed in the following disposal and recycling activities:

- *the transport of chicken meat industry wastes*
- *temporary storage of chicken processing and farming wastes*
- *off-site composting of chicken carcasses*
- *on-farm composting of chicken farm wastes*
- *on-farm disposal of chicken farm wastes*
- *transfer to an off-site disposal site*
- *direct transfer of materials to markets*
- *the application of litter/manure material in the agricultural and horticultural sector.*

The development of best practice industry and government policies for chicken meat industry waste management will require further consultation with relevant industry stakeholders.

This should lead to a formal framework inclusive of 'Codes of Practice' addressing best practice waste management principles.

To progress this to reality, government, in partnership with the waste management industry, should encourage further technical research into advanced composting systems for chicken industry wastes.

An integrated approach to promoting the use of organic composts and addressing the issue of siting compost processing facilities also needs to be adopted to ensure the acceptance of chicken meat industry waste material. For example, efforts to promote composted green organic material, and to ensure planning for suitable green organics processing locations, should incorporate the composting of other organic materials. A tiered and integrated approach acknowledging a variety of waste types, including green organic waste, food waste and agricultural wastes, could be adopted to ensure adequate planning for composting facility locations.

1. Introduction

PPK Environment & Infrastructure Pty Ltd was commissioned by the South Australian Environment Protection Agency to undertake a review of the potential environmental and health impacts of on-farm disposal of chicken carcasses, and to recommend management options for the recovery and recycling of wastes from the chicken processing and farming industry.

The nominated objectives of the report were:

- to identify the geographical locations of, and quantify the current and future volumes and types of waste produced from, commercial chicken farms and processors
- to identify existing recovery, re-use, recycling and disposal practices for wastes produced from commercial chicken farms and processors
- to identify the potential environmental and health impacts of on-farm disposal of chicken carcasses
- to identify and recommend management options based on ecologically sustainable development principles for the collection, re-use, recycling and disposal of wastes produced from commercial chicken farms and processors
- to identify existing practices, and recommend options based on ecologically sustainable development principles, for the management of diseased chicken carcasses and single incident large volume mortalities.

For each of these objectives background information and recommendations are made.

2. Methodology

In conducting this research, PPK recognised the importance of consulting thoroughly with the chicken processing and farming industry to obtain required data, and to ensure that industry feedback could be incorporated in best practice recommendations. In order to obtain all of the required information, PPK project team members met with members of relevant industry associations, spoke with key staff at chicken processing facilities, and made site visits to chicken waste composting facilities. A combination of telephone interviews and faxed questionnaires were used to obtain industry feedback (refer to Appendix F which outlines the questions posed to chicken meat processing companies).

In addition to consulting with people in the industry, relevant literature obtained from industry contacts and information obtained from the Internet was reviewed.

2.1 Information Sources

The following people assisted in providing information for PPK's research:

1. Laura Fell – South Australian Farmers Federation
2. Natalie Schaeffer – South Australian Farmers Federation
3. Peter Wadewitz – Peats Soil and Garden Supplies
4. Wayne Prosser – Steggles
5. Paul Cox – Inghams
6. Margaret Sexton – Inghams/Chicken Meat Council of SA
7. Brian Smith – Neutrog
8. Kim Critchley – Dept of Primary Industries SA
9. Mr David Lee - Victoria (conducted research on composting)
10. Helen McPherson – EHO Rural City of Murray Bridge
11. Dr Nick McClure – Flinders University of SA – School of Biological Sciences
12. Gino Dottore – Adelaide Poultry
13. Charles Rikard-Bell – Joe's Poultry
14. Angus Irwin – Neutrog
15. Hannes Partyl – Nolan ITU
16. Peter Hemmings – Jeffries Soils

The following documents were reviewed:

1. Guidelines for the Establishment and Operation of New Poultry Farms in South Australia - Farmers Federation of South Australia, 1998.
2. Code of Practice for Environmental Management on Farms for Chicken Meat Production: Exposure Draft. QLD.

3. Feasibility Study of the Neutrog Pty Ltd Facility and Associated Putrescible Waste Management Operations. Rust PPK Environment and Infrastructure, 1997.
4. Victorian Code of Practice for Best Practice Broiler Chicken Farms – Draft Code for Public Exhibition. Panels Victoria, 1999.
5. Environmental Framework and Implementation Strategy for Poultry Operations. The Poultry Industry, US, 1998.
6. Seekins, B: 'Nutrient Management – Regulating how Manure is Managed and Used'. Biocycle, US, 1999.
7. Miller, F: 'Poultry farm Pioneers Low-Rate Composting'. Biocycle, US, 1999.
8. Rynk, R. et al : 'On-Farm Composting Handbook'. Northeast Regional Agricultural Engineering Service, US, 1992.
9. Lister, S: 'Biosecurity for meat chicken Farms'. Poultry Digest, 1999.
10. Glenn, J: 'Regulators Tackle Manure Management'. Biocycle, US, 1999.
11. Reynnells, D: 'Changing the Perception – Turning Animal By-Products into Resources'. Biocycle, US, 1999.
12. Environmental Guidelines for Composting Works and Organic Waste Treatment Depots in South Australia – Consultation Draft'. Environment Protection Authority, SA, 1998.
13. Mortality Management (<http://gallus.tamu.edu/waste/mortal.html>.)
14. Livestock and Poultry Waste Management (<http://res.agr.ca/lond/gp/bmp/lpwmbmp.html>).
15. Best Management Practices – Carcass Disposal. Minnesota Board of Animal Health. (<http://www.umn.edu/Documents/K/A/bmp96.html>).
16. In-Vessel Co-Composting of Poultry Litter and poultry Mortality (carcasses) for Use as a Ruminant Livestock Feed ingredient – Department of Agricultural Sciences, Texas.
17. Composting Dead Poultry – Virginia Cooperative Extension.
18. http://www.griffind.com/html/what_we_do_.html
19. <http://www.aces.edu/departement/extcomm/publications/anr/anrps.html>

2.2 Relevant Legislation

The objectives of the following South Australian legislation have been considered in the research conducted for this report, and are reflected in the recommendations provided for best practice management of chicken industry waste:

- Environment Protection Act 1993
- Sewerage Act 1929.
- Public and Environmental Health Act 1987.
- Water Resources Act 1997.
- Development Act 1993.
- Local Government Act (as amended)

- Meat Hygiene Act 1994.
- SA Standard for Hygienic Processing of Poultry for Human Consumption
- Australian Standards for:
 - < Hygienic Production
 - < Construction of Premises Processing Animals for Human Consumption
 - < Premises Processing Meat for Human Consumption
 - < Transport of Meat for Human Consumption.

3. Overview of the Chicken Processing Industry in South Australia

Appendix A provides an overview of the chicken meat processing industry in South Australia. The three key areas associated with the chicken meat industry are chicken breeder farms, chicken grower farms and meat processing.

Within the chicken meat industry, wastes are generated and need to be appropriately managed at the stages described below.

3.1 Chicken Breeder Farms

These farms house birds producing fertile eggs. At the end of their productive life, approximately 67 weeks, the birds are removed for chicken meat processing. After each breeding cycle, the used litter and manure is also removed from the ground (or slats) of the breeder sheds.

The mortality rate in chicken breeder farms is usually higher than in grower farms due to the longer cycle period. The general industry accepted estimate of mortality is twenty percent of the number of birds per breeding cycle.

Laid eggs are transported to a hatchery, where they are artificially incubated. Hatched chickens are provided to the chicken grower farms.

Types of wastes produced: litter and manure, chicken carcass waste.

3.2 Chicken Grower Farms

These farms house chickens that are grown in free range conditions in a controlled environment. The growth cycle for chicken growing is approximately six to eight weeks, after which the chickens are ready for processing. After each growing cycle, the litter and manure is removed from the poultry sheds.

Whilst the mortality of chickens does vary per growing cycle, a general industry accepted estimate of mortality is five percent of the number of birds grown per cycle.

Types of wastes produced: litter and manure, chicken carcass waste.

3.3 Chicken Meat Processing

Once the chickens have completed the growth cycle they are ready for processing. Waste from processing plants is produced from the continuous cleaning of the chicken processing facility.

Types of wastes produced: offal, feathers, viscera, and other meat wastes.

Figure 3.1 summarises the waste management streams at various stages in chicken meat processing.

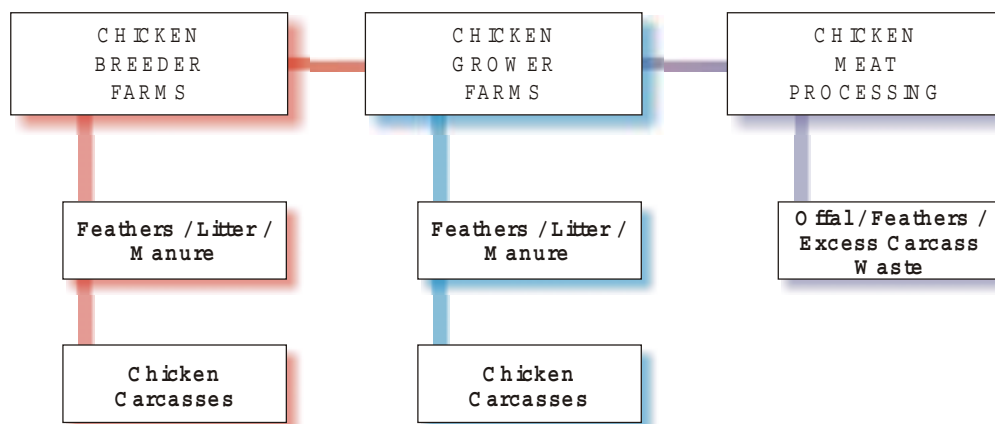


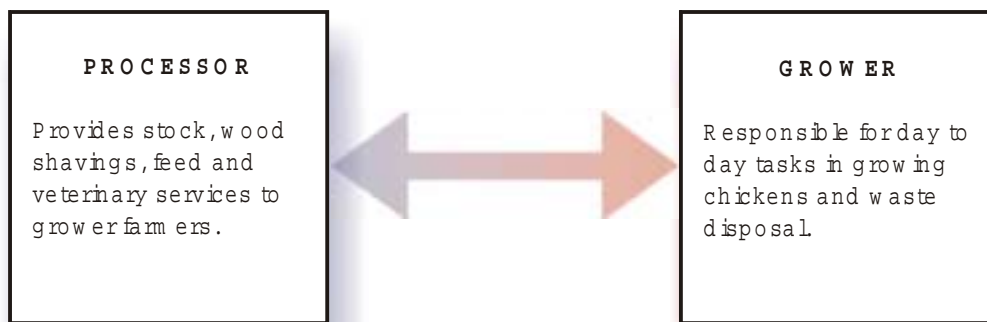
FIGURE 3.1
Waste Management Streams

3.4 Relationship Between Processors and Growing Farm Contractors

Inghams, Steggle, Joe’s Poultry and Adelaide Poultry are the four major processors of chicken meat in South Australia, accounting for 99% of chicken meat production throughout the State. Whilst the major processors own and manage some chicken grower farms, most chicken grower farms are directly contracted by the producer to grow chickens (refer Appendix A). The chicken producers provide the stock, feed, litter, and veterinary services to the grower farms, whilst the contracted growers are responsible for growing the chickens.

3.4.1 Waste Management Responsibility

Current arrangements by the four major processors require contract growers to dispose of the chicken carcass and other waste generated as part of their operations in an environmentally sustainable manner. The processor either pays a disposal fee to its contract farmer, or this responsibility is included in other commercial contractual arrangements.



**FIGURE 3.2
Relationship Between Processor and Contract Grower**

4. Identification and Quantification of Types of Wastes Produced in the Chicken Meat Industry

The locations of all farms associated with the Chicken Meat Industry in South Australia are detailed in Appendix B. In addition, the proximity to sensitive ground and surface water is also shown.

Maps showing the average tonnes of chicken carcass material and manure/litter material are provided in Appendices C and D.

The amount of chicken carcass waste varies considerably and is dependant on the death rate of chickens per growing or breeding cycle, as well as the level of production in the industry. The amount of chicken litter waste also varies based on the type of litter and animal feed used.

The following key assumptions have been made in providing estimates on wastes generated in the chicken processing and farming industry:

- Calculations are based on a 5% mortality rate per growing cycle for grower farms, the average growing cycle being 6 to 8 weeks.
- Calculations are based on a 20% mortality rate per breeding cycle for breeder farms, the average breeding cycle being 67 weeks.
- The average weight of a broiler carcass (from a chicken growing farm) is 1.5 kg, and the average weight of a breeder carcass (from a breeder farm) is 3.5 kg (note: these weights would vary depending on the growth stage of the chicken).
- 3.2 m³ of chicken litter equates to approximately one tonne of this material.
- Waste generated from the meat processing facilities has been calculated with a consideration of the average percent production for each processor.
- Where waste estimates could not be provided by individual processors, quantities have been calculated using farm size estimates and average production for each processor.
- It has been assumed, where growers are not utilising the collection services through Neutrog or Peats Soil, that on-farm disposal of the carcasses is taking place.

Table 4.1 Total Quantities and Management of Chicken Meat Industry Waste in South Australia

| Waste Category | Quantity per Growing Cycle | Quantity per Year | Recycling/Disposal Method |
|---|---|--------------------------|---|
| Chicken carcasses | Grower farms 334 tonnes per 8 week cycle | 2171 tonnes | Recycled into compost |
| | Breeder farms 288.4 tonnes per 67 week cycle | 223.9 tonnes | |
| | Grower farms 163 tonnes per 8 week cycle | 1059.5 tonnes | On-farm disposal |
| | Breeder farms 70 tonnes per 67 week cycle | 54 tonnes | |
| Meat processing waste (offal, excess carcass waste, feathers) | 315 tonnes per week | 16,380 tonnes | Rendered at a protein-recovery plant |
| Manure/litter from farms | 9,391 tonnes per 8 week cycle | 61,041 tonnes | Collected by a contractor and either composted or taken directly to market gardeners. |
| | 11,055 tonnes per breeding 67 week cycle. | 8579 tonnes | |

5. Environmental and Public Health Impacts from Chicken Meat Industry Waste Management

A primary environmental concern in the management of chicken meat industry waste is the on-farm disposal of chicken carcass waste, which can pollute groundwater and lead to contaminated land. However, even in the event of favourable alternatives being pursued, such as off-site composting, care needs to be taken in the temporary storage and transport of chicken waste material to minimise negative environmental and health impacts. The following environmental and health issues need to be considered in the management of chicken meat industry waste:

- groundwater contamination with waste leachate due to on-farm disposal of chicken carcasses
- odour from the decomposition of the waste material
- pollution of surface waters with waste leachate from the storage and disposal of the material—of particular concern in water catchment areas
- vermin and fly infestation due to inappropriate storage of the materials
- odour, dust and the potential leakage of waste leachates during the transport of the material
- biosecurity issues in the collection of waste material from farms
- loss of amenity to adjoining land owners due to poor environmental practices
- potential odour, surface water pollution and contamination of food produce from the inappropriate application of chicken manure and litter in the horticulture and viticulture industries.

The environmental and public health issues specific to the various chicken waste management practices are outlined in Section 6 of this report.

6. Current Recovery, Reuse, Recycling and Disposal Practices for Commercial Chicken Farms and Processors

There are a number of processes currently used for the recovery and treatment of chicken meat industry waste. They include the following.

6.1 Rendering

Rendering is a heating process that extracts useable ingredients, such as protein meals and fats. Rendering has been used for many years to convert the inedible results of the slaughtering process into meat meal, bone meal, and feather meal which are all highly valued feed ingredients. Animal fat from rendering plants, in refined forms, is used for high heat and pressure lubricants and rubber production, and fatty acids are a raw material in varnishes, cleaners, polishers, soaps and cosmetics. The waste from the four major chicken processing plants in South Australia is processed at rendering plants to produce animal feed. Ingham's have their own rendering plant located at Wingfield, a facility also utilised by Adelaide Poultry. Steggles and Joe's Poultry conduct their own processing of waste material into animal feed. The feather and offal from Joe's Poultry is processed at the Dalriada Meat Rendering Facility in Keith.

Environmental and Health Considerations

Whilst this activity is well established and enables recycling of chicken industry waste into valuable products, the following potentially negative environmental and health impacts need to be managed:

- surface water pollution, vermin infestation, dust and odour due to the storage of the waste prior to transfer
- odour, dust and leaking of waste fluids associated with the processing and transport of the waste
- biosecurity requirements for collection of the waste
- loss of amenity by adjoining land owners.

6.2 Composting

Composting of chicken carcass waste is the process of placing carcasses in layers with carbon source and manure to allow the natural decomposition process to break down the carcass and reduce its mass. Composting offers a convenient and environmentally acceptable method of disposal of chicken carcass waste. The process is recognised as an appropriate method for disposal of normal poultry mortalities in the United States, and is recognised as an environmentally sustainable alternative to on-farm burial.

Neutrog and Peat's Soils and Garden Supplies currently provide services for the collection and composting of chicken carcass waste from chicken farms in South

Australia. Both of these companies recognise the importance of the following in their operations:

1. **Biosecurity requirements:** Biosecurity can be defined as ‘a set of management practices which, when followed, collectively reduce the potential for the introduction and spread of disease-causing organisms onto and between sites’ (Lister, 1999). In the case of chicken carcass collection, this requires effective measures to ensure that disease cannot spread between farms. Therefore, sterilisation of collection containers and cleaning/disinfecting of vehicles is required.
2. **Pathogen control:** The composting process aims to sterilise the composted material, ridding it of pathogens of health concern.

Peat’s Soil and Garden Supplies (Gabalau Pty Ltd)

Peat’s Soils and Garden Supplies currently have a collection system in partnership with Ingham’s chicken farmers. The system involves the use of a 9 cubic metre, force-aerated bin for the collection and composting of chicken carcass waste. The bins are kept on the farm for the period of the growing cycle (usually 8 weeks), prior to collection for transfer to the Peat’s Soils and Garden Supplies composting facility. (Refer to Appendix G – Photos of the Bin Used by Peat’s Soils and Garden Supplies.)

Whilst both anaerobic and aerobic composting occurs in these bins, they are fully enclosed to contain odours. After transfer to the composting facility, the bins are cleaned and sterilised and returned to the farmer. The truck collects the bins separately from each farm, which fully addresses biosecurity requirements.

Neutrog Pty Ltd

The system provided by Neutrog involves collecting chicken carcass waste in 240 litre garbage bins. Neutrog collects the bins from the farms three times per week, and bins are collected from the edge of the farm property in order to comply with biosecurity requirements. To address potential issues of odour, flies and vermin, and leachate from the garbage bins, Neutrog require all of their customers to line the bins with absorbent litter prior to filling with carcasses, and to layer absorbent litter between carcass layers to adequately absorb foul smelling liquids. Odours could be further minimised with this system by storing chicken carcasses in a freezer prior to collection. Neutrog regularly monitor the material collected in their bins, and collection is refused if contamination with unwanted materials is present. When the bins are collected the farmers are provided with clean bins in exchange. The bins are emptied at the processing site, where they are cleaned and sterilised prior to re-use as per biosecurity requirements.

Environmental and Health Considerations

The following potentially negative environmental and health impacts need to be managed with off-site composting systems for poultry waste:

- surface water pollution, vermin infestation, fly infestation, dust and odour due to the storage of the waste prior to transfer
- odour, dust and leaking of waste fluids associated with the transport of the waste

- biosecurity requirements for collection of the waste
- loss of amenity to adjoining land owners
- negative environmental and health impacts associated with the composting site operations

An alternative option, apart from on-farm disposal, is required, should these two major facilities reject the collection of the chicken waste material due to contamination or the physical condition of the waste.

6.3 On-Farm Disposal of the Waste

On-farm disposal of chicken carcass waste is not an environmentally preferred option and is strongly discouraged. Disposal pits and trenches are the two most typical burial methods for on-farm disposal of chicken carcasses. There is the potential to pollute ground and surface waters where pits or trenches are constructed in permeable or fractured soils or where high water tables exist. Harmful components of poultry wastes include nitrates, phosphates, organic material and bacteria. **On-farm disposal should be discouraged, and farmers should be urged to consider more environmentally sound recycling methods for chicken carcass waste.** On-farm disposal should be banned in water catchment and water protection areas. Where on-farm disposal is the only viable option, minimum standards should be adhered to (refer to Section 10 of this report).

Environmental and Health Considerations

The following potentially negative environmental and health impacts need to be managed with on-farm burial of poultry waste:

- surface water pollution, vermin and fly infestation, and odour due to the storage and disposal of the waste
- pollution of groundwater from waste leachates
- contamination of land with waste material
- loss of amenity by adjoining land owners
- pests and scavengers.

6.4 On-Farm Composting of Waste

Carcass composting is normally done using purpose built rotary composters. The rotating drum moves and aerates the material, accelerating and homogenising the compost process. Appendix G shows a photo of a typical rotary composter.

Bunker systems are also very effective in carcass composting, and are more suitable for use on farms with low watertables, low rainfall and good separation distances from sensitive land uses. Bunker composting involves simply stacking the materials in piles to decompose over a long time period. Appendix G shows a diagram of a typical bunker compost system.

With any on-farm composting method, the compost should be kept well-aerated to minimise odour, and the correct mixture of compostable material should be used to ensure that the material is composted effectively.

Examination of on-farm composting practices identified that this is a potential strategy for disposal of birds in an environmentally sound way. The limitations of this option include the initial high capital cost of set-up per farm (\$5,000 to \$10,000) and the need for regular attention and technical understanding to ensure the composting process operates effectively.

Environmental and Health Considerations

- surface water pollution, vermin and fly infestation, odour due to poor composting methods, and inadequate composting structures
- odour due to on-farm application of the composted material
- loss of amenity by adjoining land owners.

6.5 Transfer to Landfill

Chicken carcass and other chicken farm wastes may be collected and taken to an off-site disposal facility. This practice is not common due to the high costs involved, and because markets for some farm wastes, such as litter and manure, are well established. Landfills should not accept waste materials from the chicken farming and processing industry without the appropriate licence.

Environmental and Health Considerations

- water pollution, vermin and fly infestation, dust and odour due to the storage of the waste prior to transfer
- odour, dust and leaking of waste fluids associated with the transport of the waste
- biosecurity requirements for collection of the waste
- loss of amenity by adjoining land owners
- negative environmental and health impacts associated with the landfill facility.

6.6 Direct Transfer of Manure and Litter Material to Markets

Direct transfer from the chicken farms in South Australia to local markets is common practice for litter and manure material. After each growing or breeding cycle all litter and manure is cleaned out of the poultry sheds.

Litter removed from the sheds provides a valuable source of nutrients suitable for plant growth, and this makes it popular for landscaping and garden use. Transfer to local horticulture and viticulture businesses is common for individual farmers as an added source of revenue, and the product is regarded as a valuable organic fertiliser.

Best Practice Environmental Strategies for poultry operations in the United States recognise that poultry litter/manure are excellent sources of organic nutrients and can be incorporated into most farming operations when properly managed. United States strategies encourage the development of Litter Management Plans to ensure

that storage, transportation, application, and disease prevention are considered in the management of poultry and manure. If litter is improperly spread on fields at rates in excess of what crops can use or soil can hold, excess nutrient can be lost to surface and groundwater. In recognition of this issue, farmers in the United States are urged to assess the nutrient value of the poultry manure to ensure that land with an existing level of high nutrients does not receive high nutrient poultry litter.

It is also recognised in the poultry farming industry that the direct application of litter and manure material by market gardeners has been banned by some States in the United States. Companies such as Foodland and Safeway in Australia are also increasingly concerned about the direct application of animal manure by their contract market gardeners, due to potential food contamination and food safety requirements. Given these trends, it is likely that direct use of uncomposted materials in the horticulture industry will be restricted in the future and may not remain an option.

Environmental and Health Considerations

- water pollution, vermin infestation, dust and odour due to the storage of the waste prior to transfer
- odour, dust and leaking of waste fluids associated with the transport of the waste
- biosecurity requirements for collection of the waste
- loss of amenity by adjoining land owners
- fire risk with inappropriate storage of the litter material
- inappropriate application of the litter/manure material, causing environmental pollution from high nutrient concentrations
- inappropriate application of the litter/manure material, causing pathogen contamination on food produce, and the potential spread of disease.

6.7 Incineration

Incineration is an accepted method of treating chicken industry waste in the United States. This practice is not common in Australia as it is not an economically viable option. On-farm incinerators are used in the United States, yet are recognised as expensive to operate properly in order to prevent smoke and odour. Incinerators used on poultry farms in the United States are required to comply with environmental specifications.

7. Markets for Composted Chicken Industry Waste

Discussions with representatives at both Peat's Soils and Garden Supplies and Neutrog highlighted that markets for composted chicken waste material are promising. Both major processors acknowledge that the market size is capable of accepting the total waste generated from the chicken farming industry.

Neutrog utilises the chicken waste material, blended with some other materials, to produce high-nutrient organic fertilisers.

Neutrog is also involved in composting manure and litter, for which markets are well established with horticulture and viticulture industries.

Further they recognise that the capacity to process higher quantities of chicken waste is evident. However, improvements in the capacity of infrastructure and effective promotion of the products would need to accompany the increase in feedstock being accepted.

Peat's Soils also utilises the chicken waste material in a blended domestic compost. Peat's Soils is currently conducting trials on composting this material into higher nutrient products.

As with Neutrog, the chicken waste is also blended with other compostable material, for which markets are well developed with the horticulture and viticulture industries.

The capacity of these two processors, as well as other composting facilities in South Australia, to accept greater quantities of chicken industry waste material is very much dependant on their appropriate siting. This is due to the highly contentious environmental and health issues surrounding the operation of such facilities, and the potential for loss of amenity by nearby land owners.

It was noted during this project that some existing processors are restricted by the location of their facility, and they recognise that the acceptance of vast quantities of waste from the chicken meat industry would create unacceptable odours, due to their proximity to sensitive land uses.

7.1 Market Potential

International research has shown that the products of the identified processors above are used predominantly in the horticulture and viticulture industries. With the sound base of such industries in South Australia, and their forecast growth, it is reasonable to assume that the market for processed chicken wastes is robust and unlimited in terms of volumes.

In summary, it is the siting issue for composting facilities that is the limiting factor in processing capacity, not the limit in market potential.

8. The Management of Large-Scale Chicken Mortalities

Outbreaks of disease, such as the recent Newcastle's disease outbreak in New South Wales, or environmental factors, such as heat waves, can cause large-scale mortalities in the chicken farming industry. It is not uncommon for at least two major mortalities to occur per farm per year in the South Australian chicken farming industry. At an increased mortality of 20% for a chicken grower farm of 100,000 birds, this equates to an extra 45 tonnes of material per year.

The management of carcass waste beyond normal mortality poses a challenge to the chicken farming industry. Problems of odour, vermin and fly infestation can escalate with the accumulation of chicken carcass waste from large-scale mortalities. To minimise these effects, and for biosecurity concerns, the chicken carcass waste needs to be taken off the farm site as soon as possible following the 'die off' and adequately treated.

It should be recognised that the best preventative approach to minimising this problem in the industry is to ensure that practices to reduce the risk of large-scale mortalities are incorporated into farming operations. Effective mortality management should incorporate disease prevention through adequate biosecurity measures and veterinary services, nutrient management, and environmental control measures such as ventilation and temperature control.

Whilst existing compost processors in South Australia can cater for increases in mortalities in terms of processing and markets, collection methods need to be adapted to ensure that chicken carcass waste is not stockpiled at the farm site for extended periods. Collection would need to be independent of routine procedures to ensure expeditious removal.

In the event that the quantity of the chicken carcass waste cannot be treated by existing composting operators, it should be collected by a licensed waste collection contractor and disposed of at a licensed treatment facility or landfill.

Either a licensed composting operator or landfill facility should be utilised to dispose of carcass waste from large-scale mortalities. On-farm disposal of carcasses from large mortalities should not be allowed unless required under quarantine.

Discussions, with landfill operators at the Pedlars Creek Landfill Site and the Wingfield Landfill Site in metropolitan Adelaide, have indicated that they would accept chicken farm wastes, providing that they complied with the Environment Protection Agency requirements. The industry should enter into agreements with both regional and metropolitan landfills to ensure that receipt of such waste is allowable at short notice.

9. Improving Industry Commitment to Best Practice Waste Management Procedures

Specific recommendations for managing chicken meat industry waste in an environmentally sustainable manner are outlined in Section 10 of this report. The research for this study clearly highlighted the requirement for a cooperative approach between the industry and relevant government sectors to advance the industry's commitment to best practice waste management techniques. The following strategies to address this issue are recommended:

1. Industry associations such as the South Australian Farmers Federation and the Chicken Meat Council of South Australia, in cooperation with the Environment Protection Agency, should undertake further consultation with chicken farmers and processors to develop industry waste management standards, based on the findings of this report. For example: the best practice methods outlined in Section 10 of this report need to be incorporated into an industry 'Code of Practice' and policy, such as those addressing composting operations, landfill operations, contaminated land and catchment management.
2. The government, in co-operation with industry bodies such as the South Australian Employers Chamber of Commerce and Industry (SAECCI), the Waste Management Committee, and the Waste Management Association of Australia, needs to address the issue of siting composting facilities. This will be important in ensuring that compost processors can accept chicken meat industry waste material.
3. Government and waste management industry support is required for researching advanced composting technologies and promoting market opportunities for composted materials; these will support the use of chicken industry waste as a valuable resource.
4. Chicken farmers and processors should be required to develop Environmental Management Plans for their operations, with the guidance of industry standards in this area.
5. A working group consisting of the South Australian Farmers Federation, Natural Resource and Chicken Industry Committee, the Environment Protection Agency, local government, and the Chicken Meat Council of South Australia should be formed to pursue the development of standards, and to measure industry performance in best practice waste management.

10. Recommendations for Best Practice Management of Chicken Meat Industry Wastes

Transport of chicken processing and farming wastes (for transfer to markets, composting facilities, or to landfill)

1. The collection contractor must be licensed by the Environment Protection Authority to transport chicken carcass waste.
2. Collection vehicles must ensure containment of liquids and odour that may cause an environmental nuisance or offensive condition.
3. It must be ensured that waste water from cleaning waste collection vehicles does not pollute surface water or ground water, or result in soil contamination.
4. Collection vehicles must meet the biosecurity requirements of the chicken meat industry.

Storage of waste materials, including chicken carcasses from farm operations, litter and manure material from farm operations, and wastes from chicken meat processors, prior to disposal

5. Litter should be removed from the site immediately where practical, or be stockpiled on a prepared storage area if stored for longer than 48 hours (2 days).
6. Stormwater run-off should be diverted around litter stockpiles to ensure that leachate from the waste material does not pollute surface water or ground water.
7. Litter should be stored under an adequately sheltered area (ie under adequate roofing) to prevent stormwater run-off pollution.
8. The site for stockpiling waste should be as far from surface water sources as possible, and run-off from the waste storage area must be prevented from contaminating nearby surface waters.
9. Litter storage on site should be on an impervious base.
10. Litter should be stockpiled as far from adjoining sensitive land uses as possible.
11. Litter should be stored in a manner that minimises fire risk, and fire safety equipment should be kept on site.
12. Dead birds should be stored in a manner to ensure that they do not deteriorate before removal from the site, such as in a refrigerator or freezer.

Off-site composting of chicken carcass waste

Composting contractors must ensure that their services address the following:

13. Clear instructions on the use of the collection container, in order to minimise odour problems, fly activity, and prevent vermin infestation, should be given by the composting contractor to the farmers. It is preferable that these requirements be specified in contractual arrangements with the growers. These requirements should also be regularly audited by the composting contractor.
14. Biosecurity requirements must be adhered to in the management of the collection system.
15. During heat wave periods the frequency of collection should be daily, or alternatively chicken carcasses should be stored in a cold room prior to disposal, to minimise decomposition rate and odour.
16. The bin capacity, or frequency of collection, should ensure that bins do not overflow at any time.
17. Bins should be thoroughly cleaned and sterilised after each collection, in order to minimise odour and comply with biosecurity requirements, and waste water from bin cleaning must be disposed of in a manner which ensures that it does not pollute surface or ground waters.
18. Bins must be kept in good repair to prevent odour emissions and leakage of contaminated liquids.
19. Composting facilities must be licensed to receive chicken industry waste under the *Environment Protection Act 1993* and new composting facilities must comply with the Draft 'Environmental Guidelines for Composting Works and Organic Waste Treatment Depots in South Australia'.

Growers must adhere to the following:

20. Service instructions, provided by the relevant contractor for the use of composting bins and collection, must be complied with.
21. Bins should not overflow at any time.
22. Odour from the bin must be contained by lining the bins with an absorbent layer of litter, as stipulated in the instructions provided by the composting contractor.
23. It must be ensured that the bins are kept closed and in good repair to prevent odour emissions and leakage of contaminated liquids, and prevent access by vermin.
24. Bins should be stored in a location that is as distant from sensitive land uses as possible to minimise loss of amenity by adjoining land owners.
25. Bins should be stored on a prepared site, which should include adequate roofing to shelter the area and prevent water leaking into the bins, an impervious

surface, and stormwater protection measures to prevent the potential pollution of surface water or groundwater.

26. Where bins are required to be collected from the edge of the farm property, they should not be placed at the edge of the property any earlier than twelve hours prior to the scheduled collection time.

On-site composting of chicken farm waste

27. Composting, using aerobic systems such as the purpose built rotary composter or bunker system as shown in Appendix G, is recommended. An aerobic environment should be maintained in the compost to prevent the emission of unpleasant odours.
28. The composting site should be on an impervious surface, and have roofing to prevent water from leaking into the compost.
29. Stormwater run-off should be diverted around composting areas by drains, bund walls, or by shaping the ground to ensure that stormwater does not pollute surface water or ground water.
30. The site for composting should be as distant from sensitive land uses as possible to minimise loss of amenity by adjoining land owners.
31. The site for composting should be as far from surface watercourses as possible.
32. The use of composted material on-site should be as distant from sensitive land uses as possible to minimise loss of amenity by adjoining land owners.
33. All new composting works must obtain appropriate development approval under the *Development Act 1993*. Composting activities are classified as either Schedule 21 or Schedule 22 development, depending upon the volume of compost being produced per year.
 - Schedule 21, Development Regulations 1993, 5(3) Composting, Organic Fertiliser and Soil Conditioner Works: the conduct of works at which mushroom and other compost, organic fertiliser or soil conditioner having organic components are produced or are capable of being produced at a rate exceeding 20 tonnes per year; or
 - Schedule 22, Development Regulations 1993, 6(3) Composting Works: the conduct of works at which mushroom or other compost is produced or is capable of being produced at a rate exceeding 200 tonnes per year.

On-farm disposal of chicken farm waste

34. On-farm disposal of dead chickens is prohibited in the Mt Lofty Catchment area. This practice is strongly discouraged in all other Water Protection Areas as defined by the Environment Protection Act.
35. The excavation trench or pit should be a minimum of 3 metres above the water table.
36. A final cover for all trenches and pits shall be 0.5 metres of compacted soil.

37. Carcasses must be buried so that seepage will not issue from the pit, either surface or sub-surface, to cause spread of disease and/or pollution.
38. When a burial pit is in use, care should be exercised to ensure that scavengers do not have access to the carcasses and that fly breeding cannot occur.
39. After disposal, carcasses should be covered with at least five centimetres of firmly packed soil to discourage pests.
40. Soils for trench burial should contain at least thirty percent clay to protect groundwater, unless the groundwater depth is greater than 30 metres.
41. On-farm waste disposal is only suitable for farms on larger land areas with good separation distances from sensitive land uses.
42. On-farm disposal sites should be as distant from sensitive land uses as possible to minimise loss of amenity by adjoining land owners.

Transfer to an off-site disposal site:

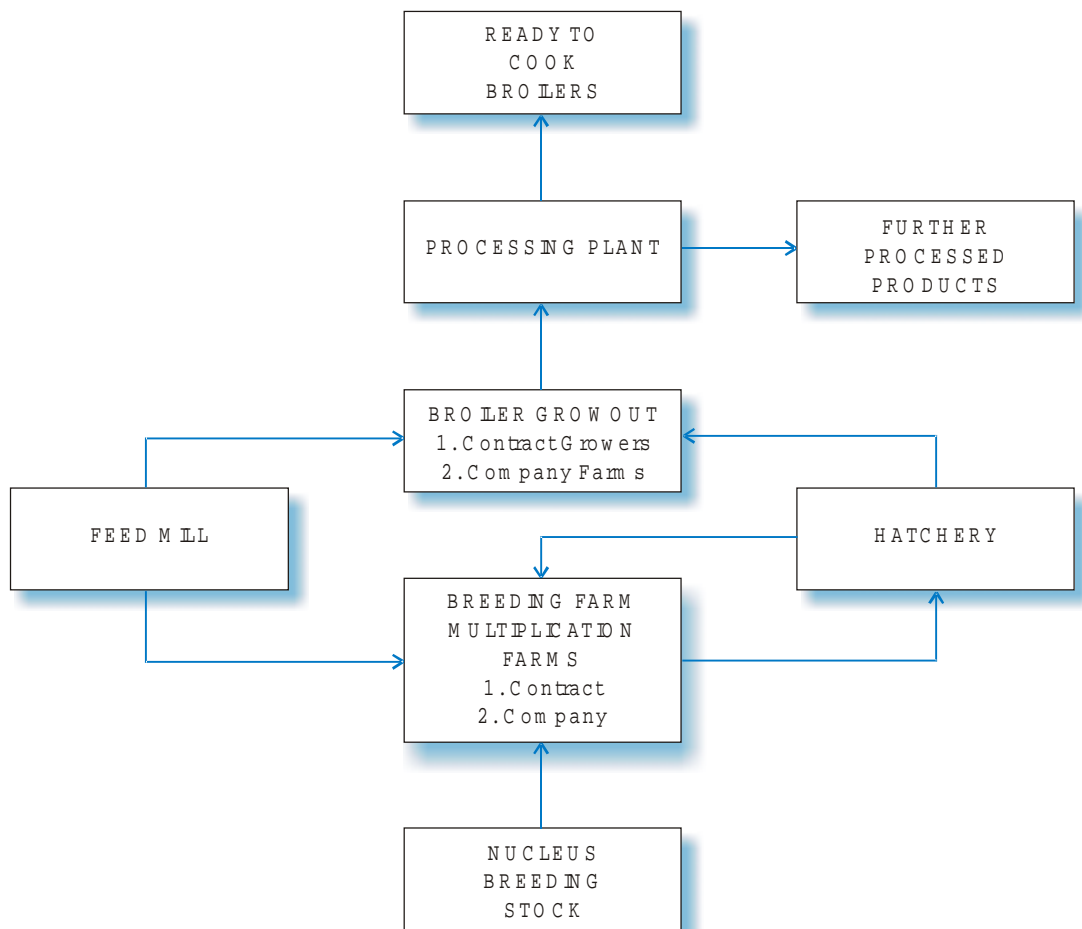
43. The landfill being used must be licensed under the Environmental Protection Act to accept chicken industry waste.

Management of large mortalities:

44. Effective mortality management procedures should be adopted, and should incorporate disease prevention through adequate biosecurity measures and veterinary services, nutrient management, and environmental control measures such as ventilation and temperature control.
45. Chicken carcasses from large scale mortalities must not be kept on the farm site for longer than 24 hours.
46. The chicken carcasses must be stockpiled according to the requirements for 'storage of waste materials prior to collection'.
47. The chickens should be stockpiled on top of absorbent litter so that leachates can be absorbed.
48. To control odour, particularly in warmer weather, the stockpiled carcasses should be covered with litter or soil.
49. Collection of carcasses from large scale mortalities must be in accordance with requirements for 'transport of chicken processing and farming waste'.
50. In the event of a large scale mortality the Department of Primary Industries should be notified immediately.

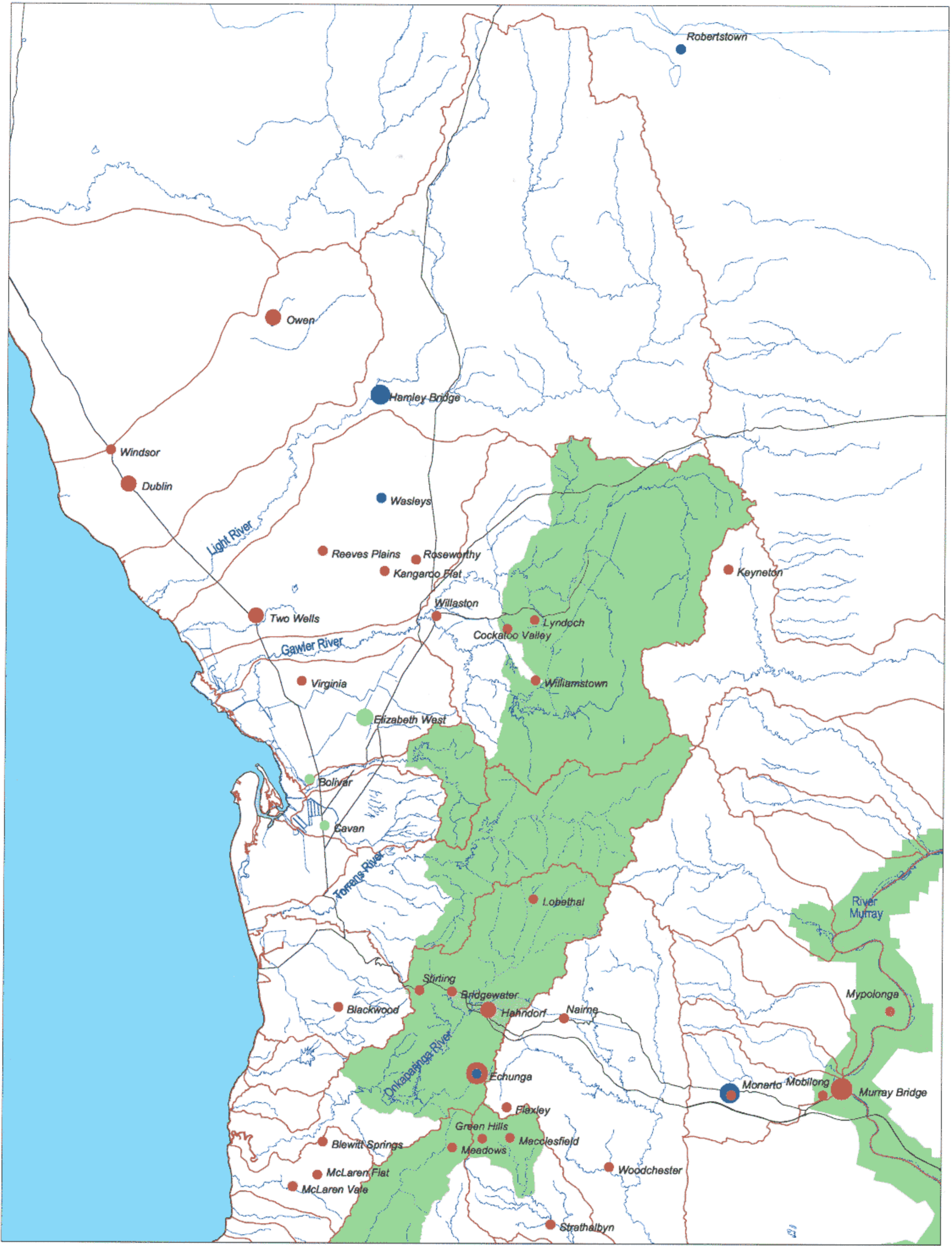
Appendix A

Overview of the Chicken Meat
Processing Industry



Appendix B

**Map: Locations of Chicken Farms
and Chicken Meat Processors**



- | | |
|------------------------------|--------------------------------|
| Chicken Grower Farms | Chicken Meat Processors |
| ● 1 - 2 | ● 1 |
| ● 3 - 9 | ● 2 |
| ● 10 - 20 | |
| Chicken Breeder Farms | |
| ● 1 | |
| ● 2 - 5 | |
| — Major Highways | |
| — Major Rivers | |
| — Catchment Boundaries | |
| — Water Protection Areas | |



Location of Chicken Farms and Chicken Processing Facilities

Appendix C

Map: Average Tonnes of Chicken
Carcass Waste Generated per
Annum per Location



Carcass Waste (tonnes)

- 0 - 50
- 50 - 100
- 100 - 150
- 150 - 250
- 250 - 750

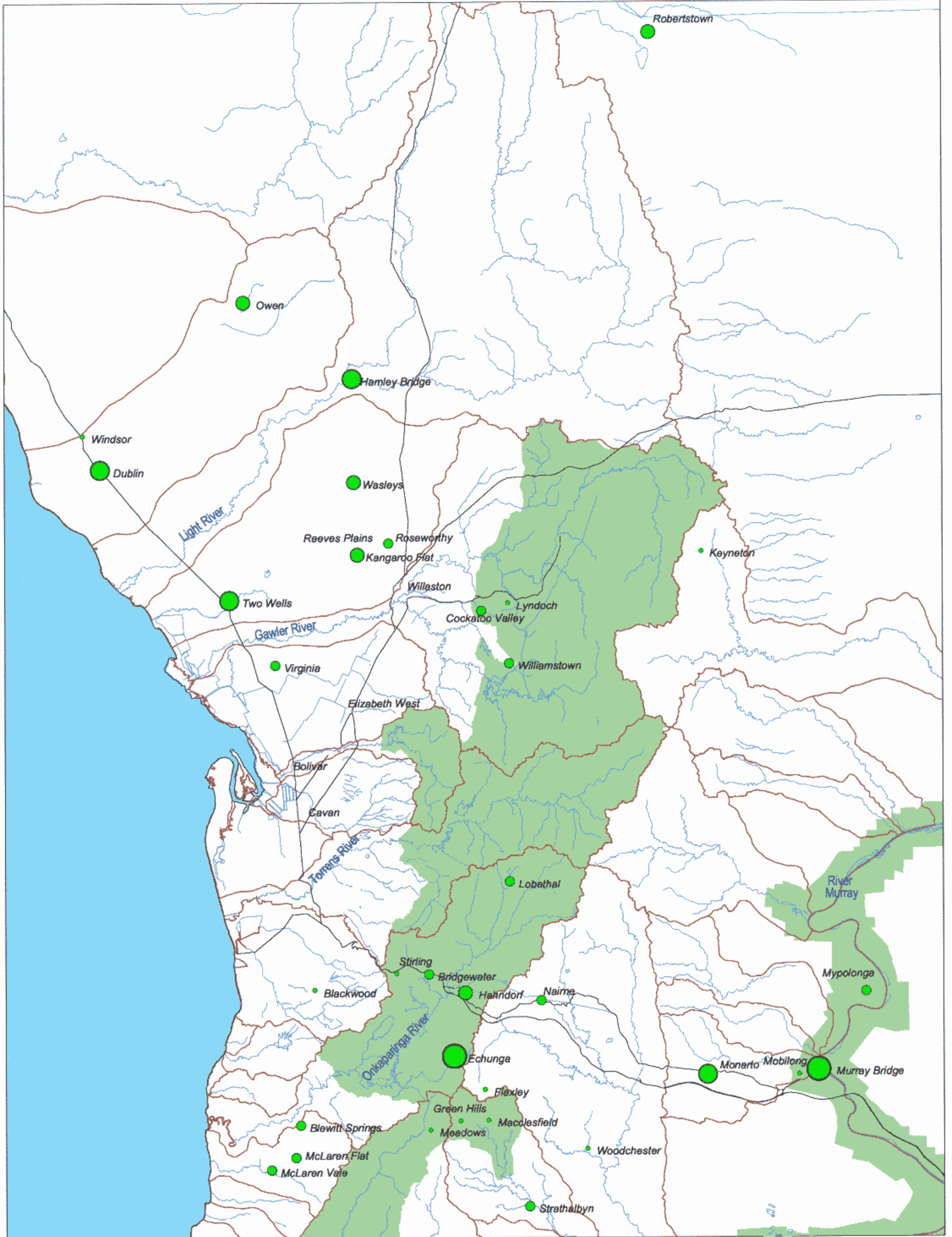
- Major Highways
- Catchment Boundaries
- Major Rivers
- Water Protection Areas



Average Tonnes of Chicken Carcass Waste Generated per Annum per Location

Appendix D

Map: Average Tonnes of Chicken
Litter and Manure Waste Generated
per Annum per Location



Manure Waste (tonnes)

- 500 - 750
- 750 - 1500
- 1500 - 2500
- 2500 - 4500
- 4500 - 12500

- Major Highways
- Catchment Boundaries
- Major Rivers
- Water Protection Areas



0 5 10 Kilometres

Average Tonnes of Chicken Litter and Manure Waste Generated per Annum per Location

Appendix E

Farm Numbers for Chicken Meat
Processors

Locations of Grower and Breeder Farms for Chicken Meat Processors in South Australia

| Suburb | Inghams | Steggles | Facen – Joe’s Poultry and Adelaide Poultry |
|-----------------|----------------------------------|---------------------|---|
| Hamley Bridge | 4 breeder farms | | |
| Monarto | 5 breeder farms | | |
| Echunga | 1 breeder farm 7 grower farms | | |
| Nairne | 2 grower farms | | |
| Strathalbyn | 2 grower farms | | |
| Owen | 4 grower farms | | |
| Murray Bridge | 13 grower farms | 7 grower farms | |
| Blackwood | 1 grower farm | | |
| Bridgewater | 2 grower farms | | |
| Cockatoo Valley | 2 grower farms | | |
| Flaxley | 1 grower farm | | |
| Greenhills | 1 grower farm | | |
| Hahndorf | 3 grower farms | | |
| Lobethal | 2 grower farms | | |
| Macclesfield | 1 grower farm | | |
| Meadows | 1 grower farm | | |
| Mypolonga | 2 grower farms | | |
| Two Wells | 1 grower farm | | 5 grower farms |
| Williamstown | 1 grower farm | 1 grower farm | |
| Blewitt Springs | | 2 grower farms | |
| Dublin | | 1 grower farm | 4 grower farms |
| McLaren Flat | | 2 grower farms | |
| McLaren Vale | | 2 grower farms | |
| Mobilong | | 1 grower farm | |
| Stirling | | 1 grower farm | |
| Virginia | | 2 grower farms | |
| Woodchester | | 1 grower farm | |
| Keyneton | | | 1 grower farm |
| Kangaroo Flat | | | 2 grower farms |
| Reeve Plains | | | 1 grower farm |
| Roseworthy | | | 1 grower farm |
| Windsor | | | 1 grower farm |
| Robertstown | | | 1 breeder farm |
| Wasleys | | 1 breeder farm | |
| Lyndoch | | 1 grower farm | |
| Bolivar | Processing facility | | |
| Elizabeth West | | Processing facility | Processing facility |
| Cavan | | | Processing facility |

Appendix F

Questions for Chicken Meat
Processing Companies

Questions for Chicken Meat Processing Companies

Waste from Chicken Processing

- What happens to the waste (offal, feathers) generated at the chicken processing plant?
- Approximately, how much waste per week (tonnes or cubic metres) is generated at the chicken processing plant?
- If recycled into protein substances, where is this conducted?

Chicken Farm Waste

- What happens to the litter waste generated from the processor's breeder farms?
- How many contract farmers (growers) does Joe's Poultry have?
- How many farms (for poultry growing) do Joe's Poultry own (if any)?
- Who is responsible for the waste generated from the chicken farms, Joe's Poultry or the individual farmers?
- What happens to the litter waste generated at the poultry farms (manure, litter etc)? ie. Do farmers have their own local markets for the material, or is it taken to a composting facility?
- If possible, identify how much litter waste is generated per farm per week (in volume or weight)?
- If possible, identify how much chicken carcass waste is generated per farm per week (in volume or weight)?
- What happens to the chicken carcass waste generated from the poultry farms ie. Do they dispose of the carcasses on-site? Is there a collection system for taking the chicken carcass waste to a recycling facility? Do the farmers compost the chicken carcass waste on-site? (if there is a combination of these practices, identify approximate percentages of farms using each system)
- If the chicken carcass waste is taken to a recycling facility: which facility is it taken to? How is the material collected (container and frequency of collection)? And who collects the material?
- What is the procedure, for the management of diseased chicken carcass waste, and for the management of chicken carcasses from single incident large volume mortalities?
- Do you have any further comments, which will assist in the development of best practice policies, for the management of waste from commercial chicken farms/processors?

Appendix G

Photos and Diagrams of
Composting Systems

Peats Bio-Composter™

Australian Patent application no. PP7816 pending



Left and Right:
Bio-Composter unit
under construction



Left: Ventilation pipes
placed on bottom of
Bio - Composter bin.
Right: A layer of Chip is
spread over pipes to
prevent clogging.



Left: Bio-Filter and
blower assembly.
Right: Bio - Composter
arrives at farm.



Left: Complete
Bio-Composter unit
installed and
operational.
Right: Mortalities are
placed in bin,
alternating one side to
the other.



Left: Bin lids are
designed to open
easily.
Right: A layer of spent
litter is spread over the
mortalities with a crab
rake.



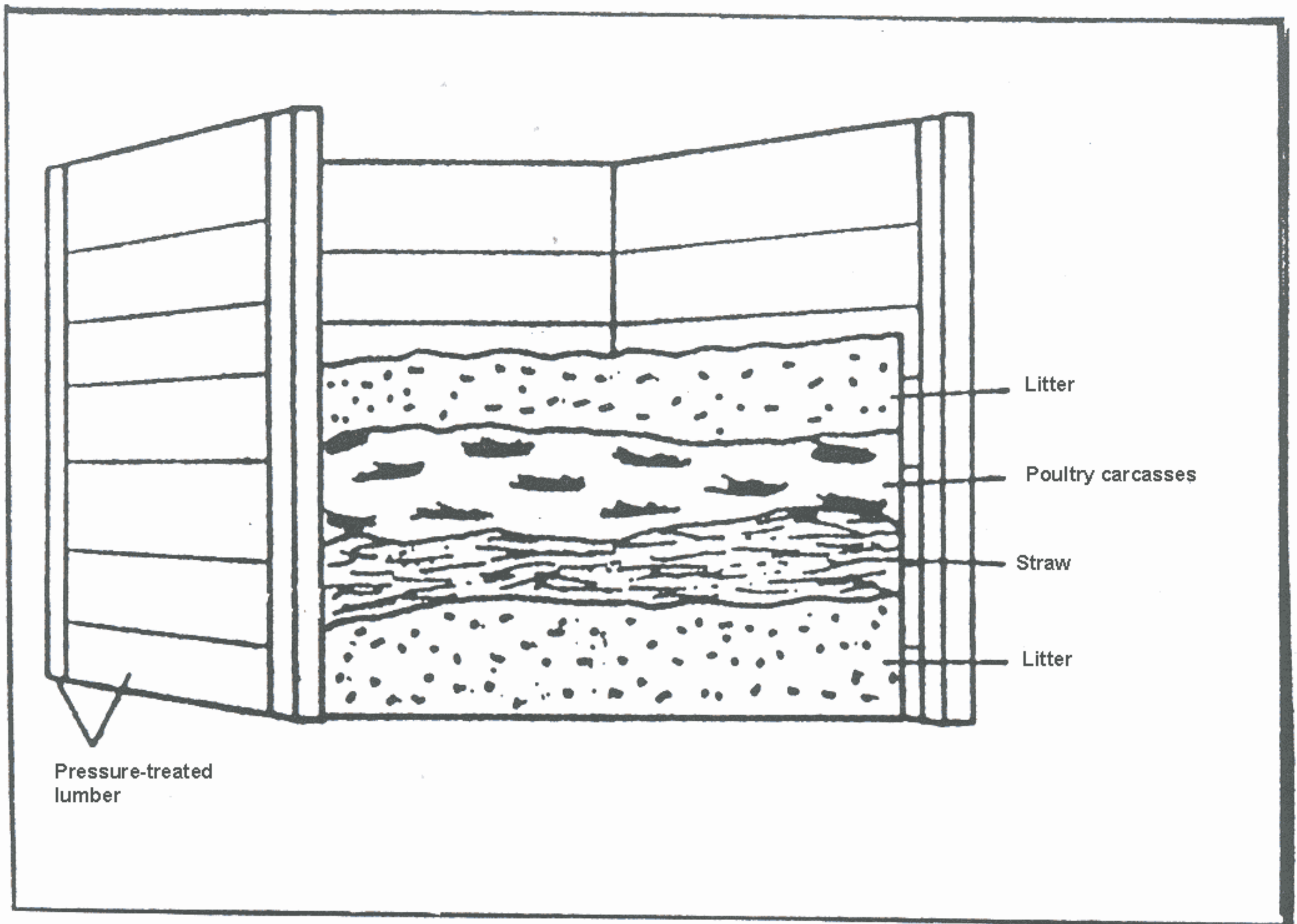


Figure 2 Poultry carcass composting bin.



Figure 3 Rotating compost drum.



Figure 4 Poultry carcass bin with litter.